REMARKS

Claims 1, 3, 6-7, 10 and 13-14 are pending in this application. Again, base claims 1, 6 and 13 are believed to be distinguishable over the cited prior art. However, for purposes of expedition, base claim 6 has been amended to further define the average width of the polycrystalline silicon grains. Claim 8 has been canceled without prejudice or disclaimer to avoid redundancy.

Turning now to the substance of the Office Action, claims 1, 3 and 13-14 have again been rejected under 35 U.S.C. §102(b) as being anticipated by Jung, U.S. Patent No. 6,825,493, or in the alternative, under 35 U.S.C. §103(a) as being unpatentable over the same Jung, U.S. Patent No. 6,825,493 for reasons stated on pages 3-4 of the Office Action. Similarly, claims 6-8 and 10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the same Jung, U.S. Patent No. 6,825,493, as applied to claims 1, 3 and 13-14, and further in view of Yang, U.S. Publication No. 2002/0197759 for reasons stated on pages 5-6 of the Office Action.

In support of these rejections, the Examiner asserts that Jung '493 teaches,

> "the width of the overlap corresponds to movement of the mask, which is varied between 0.7 micrometers and 1.7 micrometers (col. 9, ln 45-67; col, ln 25-45; and col 14, ln 1-25) ... silicon grains have a width of 12 micrometers (col 10, ln 1-15) and have a grain width of 1.7 micrometers **when the overlap is decreased** (col 10, ln 1-65)."

In addition, the Examiner further asserts FIG. 3C of Jung '493 allegedly discloses "the average width of the polycrystalline silicon grains ... varied between approximately 0.2 to 0.6µm."

According to the Examiner, FIG. 3C of Jung '493 "shows the grains and has a 0.7µm reference scale and the width between the grains." Moreover, **when the overlap is decreased**, the grain width varies from 12 micrometers to 1.7 micrometers.

However, the Examiner's assertions are incorrect and not supported by Jung '493. Nowhere in the cited portion of Jung '493 is there any support for the Examiner's assertion.

According to Jung '493, the same mask 130, as shown in FIG. 5, is used to move along a substrate, covering two different areas during a crystallization process , a 1st area utilized for the driving circuits, i.e., CMOS devices, as shown in FIGs. 6A-6D, a 2nd area utilized for the

switching circuits, i.e., TFTs, as shown in FIGs. 7A-7D.

For example, in the embodiment shown in FIGs. 6A-6D, the mask 130 is used to move along the lateral grain growth of the grains (see FIG. 6A) in a X-direction by a distance of about 0.7 micrometers (see column 9, lines 54-55 of Jung '493) during the fabrication of the **driving circuits, i.e., CMOS devices**. As a result, the polycrystalline silicon grains are obtained with a width "P" of 12 micrometers (see column 10, lines 8-10 of Jung '493).

In a separate embodiment shown in FIGs. 7A-7D, the mask 130 is used to move in a X-direction by a distance of about 1.7 micrometers (see column 10, lines 40-41 of Jung '493) during the fabrication of the **switching circuits, i.e., TFTs**. As a result, the resulting grains are obtained with a width of 1.7 micrometers (see column 10, lines 64-65 of Jung '493). According to Jung '493, each grain has a width of about 1.7 micrometers (μm) (see column 10, lines 64-65 of Jung '493), which is sufficient for the active layers of the TFTs (see column 11, lines 2-5 of Jung '493)

Therefore, contrary to the Examiner's assertion, there is **no** such disclosure from Jung '493 of **when the overlap is decreased**. Moreover, even assuming *arguendo* if there was an overlap that is decreased (from 12 micrometers to 1.7 micrometers) as alleged by the Examiner, the grain width actually increases from 1.7 micrometers to 12 micrometers, depending upon whether the crystallization occurs in the switching circuit area or the driving circuit area.

More importantly, FIG. 3C of Jung '493 does **not** support the Examiner's assertion that "the average width of the polycrystalline silicon grains ... varied between approximately 0.2 to 0.6μm". Likewise, FIG. 3C of Jung '493 does not show any 0.7μm reference scale, as mistakenly believed by the Examiner.

Rather, as described on column 3, lines 49-61 of Jung '493, FIG. 3C is an enlarged view of how a mask 130, as shown in FIG. 5, translates across the sample substrate by a distance of 0.7 micrometers in a transverse direction (i.e., in the x-axial direction). Therefore, the 0.7μm reference scale, as incorrectly assumed by the Examiner, only refers to the mask 130, as shown in FIG. 5, being translated by 0.7μm.

In fact, as expressly described by Jung '493, when the same mask 130, shown in FIG. 5, moves by 0.7 micrometers, the average width of the grains becomes 12 micrometers (see column 10, lines 8-10 of Jung '493) in the driving circuit (CMOS) area, and 1.7 micrometers (see

column 10, lines 64-65 of Jung '493) in the switching circuit (TFT) area.

Nevertheless, the Examiner has maintained these rejections, and has further dismissed the Declaration under 37 CFR §1.132 that was filed on March 26, 2008 to demonstrate UNEXPECTED RESULTS when Applicants' claimed "width of the overlapping region during crystallization corresponds to the distance, and is varied from no less than 0.5 μm to 2 μm," and "the average width of the polycrystalline silicon grains is varied between approximately 0.2 μm and 0.6 μm, and "is decreased when the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased" as defined in base claims 1 and 13.

On page 6 of the Office Action, in support of the dismissal of Applicants' filed Declaration under 37 CFR §1.132, the Examiner asserts that,

> "the declaration fails to show unexpected results because the declaration fails to compare the closest prior art, Jung, with the claimed invention."

However, the Examiner's assertion is **not** understood. While Applicants' Declaration under 37 CFR §1.132 clearly provides testimony of Applicants' claimed invention relative to Jung '493 and Yang '759, UNEXPECTED RESULTS, as demonstrated, are achieved when Applicants' claimed "width of the overlapping region during crystallization corresponds to the distance, and is varied from no less than 0.5 μm to 2 μm," and "the average width of the polycrystalline silicon grains is varied between approximately 0.2 μm and 0.6 μm, and "is decreased when the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased" as defined in Applicants' base claims 1 and 13, and has **no** bearing as to how Applicants' base claims 1 and 13 are compared with Jung '493.

Specifically, on page 2 and page 4 of Applicants' filed Declaration under 37 CFR §1.132, the inventors testify that,

> "we also observed, as explained at page 5 of Exhibit A, that as the overlap increased from 0.5μm to 2.0μm, both field effect mobility and threshold voltage tended to be nearly constant with little variation (as shown in FIG. 7 of Exhibit A), which is a result that is somewhat contrary to other results in conventional scientific literature" and
>
> "we discovered that the width of the grains is highly significant because the grains exhibit the **unexpected property of having only slight variations in field effect mobility and threshold voltage** once the grain width exceeds 0.2μm

but not greater than 0.6μm, which is contrary to the results predicted by other scientific literature in the field."

As a matter of law, the Declaration must be considered and cannot be dismissed in the manner outlined by the Examiner on pages 6-8 of the Office Action. For example, in *In re De Blauwe et al.*, 222 USPQ 191 (June 8, 1984), the Federal Circuit noted that,

> "Examiners will consider an affidavit or declaration under 37 CFR §1.132 if submitted prior to final rejection or with the first response after final rejection for the purpose of overcoming a new ground of rejection or requirement made in the final rejection. United States Patent and Trademark Office, Manual of Patent Examining Procedure §716 (4th ed. rev. 1982). Affidavits or declarations filed after final rejection will be considered if a satisfactory showing under 37 CFR §1.116(b) or 37 C.F.R. §1.195 is made. Id.

Similarly, in *In re Rinehart*, 189 USPQ 143 (March 11, 1976), the U.S. Court of Customs and Patent Appeals also required the Board to consider an inventor affidavit as part of evidence on reaching obviousness determination. As a result, the Declaration under 37 CFR §1.132 as filed must be considered with proper deference to provide testimony of Applicants' claimed invention and its unexpected results, how all the cited prior art references, including Jung '493 and Yang '759 fail to disclose or suggest features of Applicants' claimed invention, and more importantly, how one skilled in the art would not be able to render Applicants' claimed invention obvious.

Separately, on page 6 of the Office Action, the Examiner further asserts that,

> "[T]he Declaration merely alleges that the invention produces unexpected results."

However, the Examiner's assertion is **not** correct. The Declaration under 37 CFR §1.132 as filed does **not** merely allege unexpected results. Rather, the Declaration sets forth in detail the background information of the disclosed invention, including the problem of making the width of the grains small, that is, the mobility of an electric field is greatly deteriorated by a scattering effect during charge transfer, and the development of solution to the conventional problems which produces UNEXPECTED RESULTS contrary to the results predicted in the scientific community in the field of thin-film transistor (TFT) technology. In other words, if the width of the

polycrystalline silicon grains is made small, i.e., smaller than the conventional width of 1.7 micrometers (μm) as disclosed in Jung '493, then the mobility of an electric field is greatly deteriorated by a scattering effect during charge transfer; see paragraph [0009] of Applicants' disclosure.

Specifically, and contrary to the results predicted in the scientific community, the inventors testify that the recognition of the width of the grains is important, i.e., the width of the grains is highly significant because the grains exhibit the **unexpected property of having only slight variations in field effect mobility and threshold voltage** once the grain width exceeds 0.2μm but not greater than 0.6μm.

The inventors further states that,

> "In conclusion, it is my belief and understanding that the method disclosed in the above-referenced patent application exhibits unexpected results for the claimed range of an average grain width which is "varied between approximately 0.2 μm and 0.6 μm." The conventional literature predicted that for thin poly-si films, as the poly-Si grain width decreased, TFT field effect mobility tended to decrease. However, as described in the enclosed article, we discovered that by varying the average grain width between approximately 0.2 μm and 0.6 μm, the grains exhibited the **unexpected result** that when the poly-Si grain width is larger than about 0.2μm, the n-channel TFT field effect mobility is only slightly affected by the poly-Si grain width."

On page 7 of the Office Action, the Examiner further asserts that,

> "Jung discloses a 2 μm mask and translating the mask by 0.7 μm (Fig. 3C and col. 3, ln 45-65), thus discloses an overlap of 1.3 μm which is within the range taught by applicant and applicant teaches when the overlap is between 0.5 and 2 μm, grain widths within the claimed range are produced (see applicant's claim 1); therefore since Jung discloses the same method, Jung inherently discloses widths within the claimed range."

However, inherency requires certainly, **not** speculation. The fact that a certain characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that characteristic. In re Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); and In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 322, 326 (CCPA 1981). To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary

skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). In relying upon the theory of inherency, the Examiner must provide a basis in fact and technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. Ex Parte Levy, 17 USPQ 2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

In the present situation, Jung '493 expressly uses a mask 130, as shown in FIG. 5, including light transmitting portions 132 having a width of 2 micrometers (μm) and light absorptive portions 134 having a width of 10 micrometers (μm). According to Jung '493, when such a mask 130 is used differently depending upon whether the crystallization process is utilized for the driving circuits, i.e., CMOS devices, as shown in FIGs. 6A-6D, or alternatively, for the switching circuits, i.e., TFTs, as shown in FIGs. 7A-7D, the polycrystalline silicon grains are obtained with a width "P" of 12 micrometers in the driving circuit area and with a width of 1.7 micrometers in the switching circuit area. There is simply **no** basis in fact for the Examiner to allege that Jung '493 inherently discloses the width of the polycrystalline silicon grains within Applicants' claimed "between approximately **0.2 μm and 0.6 μm**".

On the same page 7 of the Office Action, the Examiner further alleges that the Declaration fails to compare the disclosed invention relative to Jung '493. However, the Examiner's allegation is simply false. On pages 5-6 of the Declaration under 37 CFR §1.132, the inventors have specifically reviewed both Jung '493 and Yang '759 and testify that,

1. Jung '493 discloses a conventional sequential lateral solidification (SLC) crystallization method in which a single mask is used to fabricate both switching circuits, such as, TFTs, and driving circuits, such as, CMOS devices, in order to reduce the process time and to improve production. Such a mask 130 is shown in FIG. 5, including light transmitting portions 132 and light absorptive portions 134. Each light transmitting portion 132 has a width of 2 micrometers (μm). Each light absorptive portion 134 has a width of 10 micrometers (μm). Such a mask 130 is used differently depending upon whether the crystallization process is utilized for the driving circuits, i.e., CMOS devices, as shown in FIGs. 6A-6D, or alternatively, for the switching circuits, i.e., TFTs, as shown in FIGs. 7A-7D. For example, in the embodiment shown in FIGs. 6A-6D, the mask 130 is used to move along the lateral grain growth of the grains (see FIG. 6A) in a X-direction by a distance of about 0.7 micrometers (see

column 9, lines 54-55 of Jung '493) during the fabrication of the driving circuits, i.e., CMOS devices. As a result, the polycrystalline silicon grains are obtained with a width "P" of 12 micrometers (see column 10, lines 8-10 of Jung '493). In a separate embodiment shown in FIGs. 7A-7D, the mask 130 is used to move in a X-direction by a distance of about 1.7 micrometers (see column 10, lines 40-41 of Jung '493) during the fabrication of the switching circuits, i.e., TFTs. As a result, the resulting grains are obtained with a width of 1.7 micrometers (see column 10, lines 64-65 of Jung '493). According to Jung '493, each grain has a width of about 1.7 micrometers (μm) (see column 10, lines 64-65 of Jung '493), which is sufficient for the active layers of the TFTs (see column 11, lines 2-5 of Jung '493).

2. According to Jung '493, the smallest width for the polycrystalline silicon grains can be obtained is 1.7 micrometers (μm), which is entirely consistent with what was disclosed in the Background of the instant application. In other words, if the width of the polycrystalline silicon grains is made smaller than the conventional width of 1.7 micrometers (μm) as disclosed in Jung '493, then the mobility of an electric field is greatly deteriorated by a scattering effect during charge transfer; see paragraph [0009] of Applicants' disclosure.

3. Jung '493 does **not** disclose each of the recited features of a "width of the overlapping region during crystallization corresponds to the distance, and is varied from no less than 0.5 μm to 2 μm," and "the average width of the polycrystalline silicon grains is varied between approximately 0.2 μm and 0.6 μm, and is decreased when the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased," as recited by Applicants' independent claims 1 and 13.

4. More importantly, the grains illustrated in FIG. 3C of Jung '493 are not illustrated or described as having an average width which is "varied between approximately 0.2 μm and 0.6 μm," as recited by Applicants' independent claims 1 and 13. Moreover, FIG. 3C of Jung '493 does not show silicon grains having a width approximately within the claimed range based on the 0.7 micrometer scale. Rather, as described on column 3, lines 49-61 of Jung '493, FIG. 3C is an enlarged view of how a mask translates across the sample substrate by a distance of 0.7 micrometers in a transverse direction (i.e., in the x-axial direction). According to Jung '493, when the same mask moves by 0.7 micrometers, the average width of the grains becomes 12 micrometers (see column 10, lines 8-10 of Jung '493) in the driving circuit (CMOS) area, and 1.7 micrometers (see column 10, lines 64-65 of Jung '493) in the switching circuit (TFT) area.

These testimonies are probative evidence of how all the cited prior art references,

including Jung '493 and Yang '759 fail to disclose or suggest features of Applicants' claimed invention, and more importantly, how one skilled in the art would not be able to render Applicants' claimed invention either anticipated under 35 USC §102 or obvious under 35 USC §103.

Lastly, at the bottom of page 7 of the Office Action, the Examiner has disregarded Applicants' explanation of the significance of FIG. 3C of Jung '493. Specifically, the Examiner asserts that,

> "[A]s to the declarations discussion of Fig. 3C, the widths are disclosed in the Figure by comparison of the scale which illustrates the width of the grains is less than scale of 0.7 μm. The declaration merely restates the teachings of column 10 which discloses a width of 12 μm, however the width disclosed by Jung is not the same width as defined by applicant, as discussed previously."

However, the scale as asserted by the Examiner is very misleading. This is because FIG. 3C of Jung '493, as described on column 3, lines 49-61 of Jung '493, only shows how a mask translates across the sample substrate by a distance of <u>0.7 micrometers</u> in a transverse direction (i.e., in the x-axial direction).

The scale of <u>0.7 micrometers</u> as shown in FIG. 3C of Jung '493 DOES NOT represent the length of the grain upon which the width could be assumed as being smaller than <u>0.7 micrometers</u>. Rather, that scale refers to a mask, for example, a mask 130, shown in FIG. 5, translating or moving by 0.7 micrometers.

Of course, if the mask 130 moves by 0.7 micrometers, the average width of the grains becomes <u>12 micrometers</u> (see column 10, lines 8-10 of Jung '493) in the driving circuit (CMOS) area, and <u>1.7 micrometers</u> (see column 10, lines 64-65 of Jung '493) in the switching circuit (TFT) area.

In view of these reasons and the Declaration under Rule 312, as previously submitted with Exhibit A (earlier publication of Applicants' disclosed invention) to show UNEXPECTED RESULTS, Applicants respectfully request that the rejection of claims 1, 3 and 13-14 be withdrawn.

Turning now to the rejection of claims 6-10 under 35 U.S.C. §103 as being unpatentable over Jung, U.S. Patent No. 6,825,493 and further in view of Yang, U.S. Publication No. 2002/0197759 for reasons stated on pages 4-6 the final Office Action. Again, in view of the

Declaration under 37 CFR §1.132, and in view of the fact that neither Jung '493 nor Yang, U.S. Patent Application Publication No. 2002/0197759, as a secondary reference, discloses or suggests what the Examiner alleges, that is, the use of a mask provided with at least a light transmission region for passing a laser beam and a laser non-transmission region for blocking the laser beam, wherein the laser transmission region is wider than the laser non-transmission region by more than 1 μm, which is particularly important to achieve the "width of the overlapping region during crystallization ... is varied from no less than 0.5 μm and 2 μm" as defined in base claim 6, Applicants respectfully request that the rejection of claims 6-10 be withdrawn.

In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney at the Washington DC office at (202) 216-9505. Applicants respectfully reserve all rights to file subsequent related application(s) (including reissue applications) directed to any or all previously claimed limitations/features which have been amended or canceled, or to any or all limitations/features not yet claimed, i.e., Applicants have no intention or desire to dedicate or surrender any limitations/features of the disclosed invention to the public.

INTERVIEW:

In the interest of expediting prosecution of the present application, Applicants respectfully request that an Examiner interview be scheduled and conducted. In accordance with such interview request, Applicants respectfully request that the Examiner, after review of the present Amendment, contact the undersigned local Washington, D.C. attorney at the local Washington, D.C. telephone number (202) 216-9505 ext. 232 for scheduling an Examiner interview, or alternatively, refrain from issuing a further action in the above-identified application as the undersigned attorneys will be telephoning the Examiner shortly after the filing date of this Amendment in order to schedule an Examiner interview. Applicants thank the Examiner in advance for such considerations. In the event that this Amendment, in and of itself, is sufficient to place the application in condition for allowance, no Examiner interview may be necessary.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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